STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Forestry and Wildlife
Honolulu, Hawaii 96813

February 23, 2007

Chairperson and Members
Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

Land Board Members:

SUBJECT: Request for Approval of the Hilo Forest Reserve Koa Regeneration and Salvage Project Management Plan as Required by Chapter 183-16.5, Hawaii Revised Statutes and the Department to Procure Services for Commercial Koa Salvage Work.

Background: The Department of Land and Natural Resources, Division of Forestry and Wildlife proposes to stimulate the reforestation of native koa (*Acacia koa*) in approximately 600 acres of heavily degraded native forest areas in the Hilo Forest Reserve (page 4 of Exhibit A), TMK parcels (3) 3-37-001: por. 002, (3) 3-37-001:por. 008 and (3) 3-37-001:por. 009. These upper elevation areas of the Laupāhoehoe and Humu'ula Sections of the Hilo Forest Reserve have been degraded by long-term feral cattle grazing and the invasive species banana poka (*Passiflora mollissima*).

The proposed actions include restoring koa forests via natural seedling regeneration stimulated by soil scarification, and in one of four units, commercial salvage of dead and dying koa timber resources. These units are adjacent to State and private lands traditionally used for long-term cattle grazing operations. Though the forest reserve boundaries were fenced, these fences were not always well-maintained by the ranching lessees and range cattle commonly crossed into forested lands. As a result of the almost continuous presence of feral cattle populations, native flora has been heavily impacted. Most of the existing older koa in the project area is either dead or dying, and the groundcover layer of the proposed project area is dominated by kikuyu grass (*Pennisetum clandestinum*), 'ākala berry (*Rubus hawaiiensis*) and Hamakua pamakani (*Ageratina riparia*), which are suspected of interfering with koa seed germination and seedling establishment.

Koa is an early successional species that requires and responds vigorously to site disturbance such as soil scarification. Over the long-term, restoration of native koa forest will partially remedy the decline and disappearance of native ecosystems, increase available habitat for native birds and invertebrates, improve watershed capacity and serve as a model for restoration of other degraded native forest lands.

The project area is located within the Resource Subzone of the State Land Use Conservation District on State land. The Division conducted an Environmental Assessment process relating to the proposed project in accordance with Hawaii Revised Statutes Chapter 343. This process was completed in September 2006, when a Finding of No Significant Impact was published through the State's Office of Environmental Quality Control. There were no public comments in opposition to the proposed project.

The Division applied for and received $27,850 in federal grant funding from the USDA Forest Service Forest Stewardship Program in support of the subject native forest restoration activities. These federal grant funds will support important components of the project such as transportation, operation and maintenance of heavy equipment for soil scarification work, and staff travel during extended work periods in this remote location.

Discussion: Pursuant to Section 183-16.5, Hawaii Revised Statutes (HRS), the Division seeks Board approval of the attached management plan (Exhibit A), which includes a proposal to conduct koa reforestation work and salvage harvesting of dead and dying koa from public forest reserve lands. Should the Board approve of this Management Plan and process, the Division shall undertake the following actions:

1. Stimulation of natural koa regeneration via soil scarification in three project units that will not have any koa timber salvage activity.
2. A Request for Proposals (RFP) will be issued for koa timber salvage in the Humuula Forest Unit comprised of approximately 205 acres. The best proposal(s) will be selected by an Evaluation Committee using a comparative criteria evaluation based in part on value-added processing of local timber, number and types of direct and indirect jobs to be created, and qualification of the applicant(s).
3. Commercial Harvest Permits and/or Timber Land Licenses will be issued to the selected applicant(s) after negotiating the terms and conditions of the license.
4. Following koa salvage operations, the Division will conduct soil scarification work in this unit where koa regeneration is not evident.
5. The Division may also seek operators who have a commercial interest in small quantities of eucalyptus timber that are located on the site, in an effort to convert a few acres of existing eucalyptus to native forest.

RECOMMENDATIONS:

1. Approve the forest management plan for the Hilo Forest Reserve Koa Regeneration and Salvage Project pursuant to Chapter 183-16.5, HRS.

2. Approve that the activities proposed in the forest management plan are permitted uses within the Resource Subzone of the Conservation District.

3. Authorize the Department to procure services for the commercial salvage of koa resources as detailed above.

4. Authorize the Chairperson to negotiate Timber Land License terms for timber resource disposition pursuant to Chapter 171-54, HRS, for subsequent Board approval.

Respectfully submitted,

PAUL J. CONRY, Administrator

Attachment (Exhibit A)

APPROVED FOR SUBMITTAL:

Peter T. Young, Chairperson

Figure 1. Hilo Forest Reserve reforestation units.

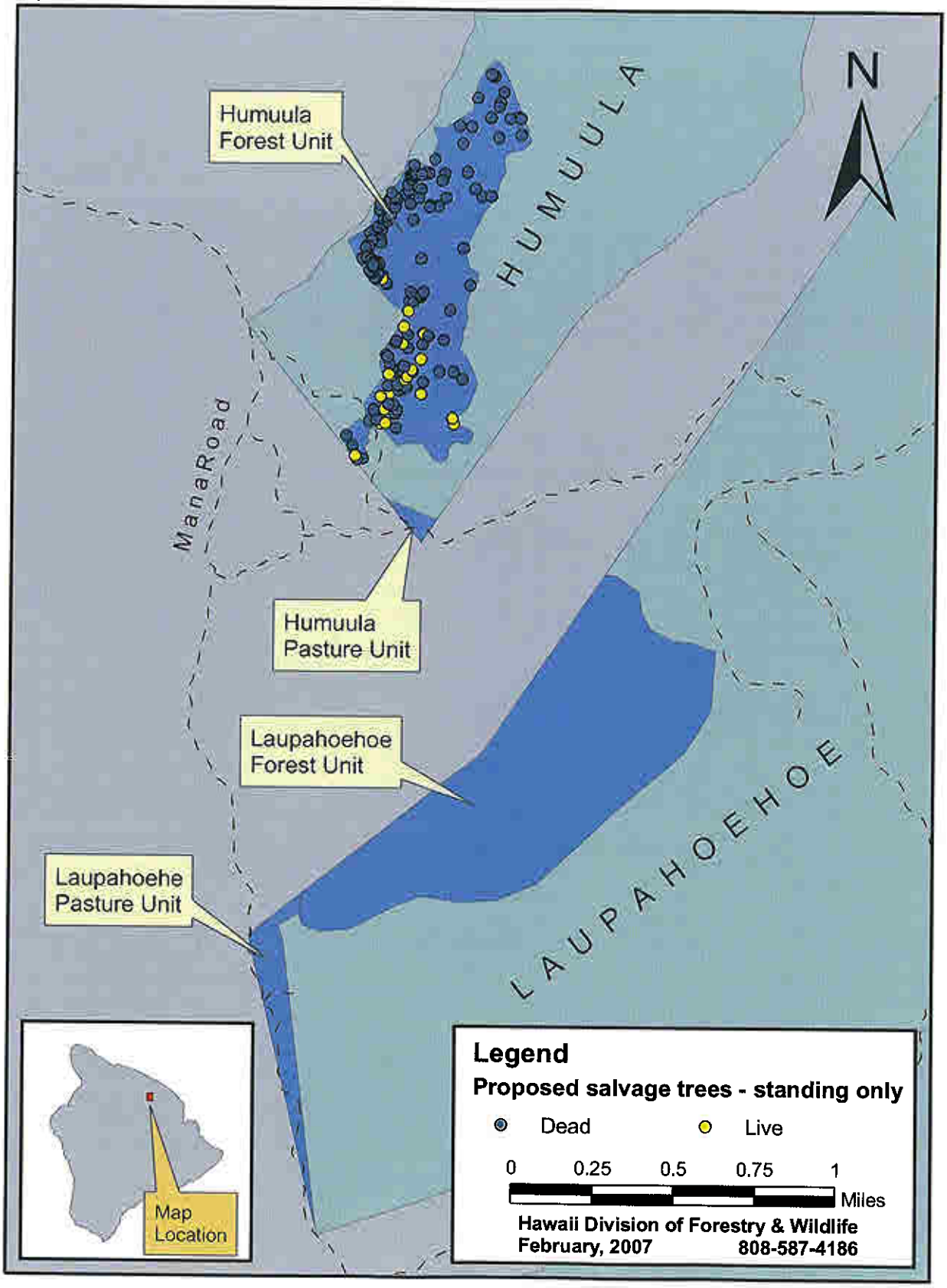

Exhibit B

FOREST MANAGEMENT PLAN

HILO FOREST RESERVE

KOA REGENERATION & SALVAGE PROJECT

February 6, 2007

Prepared by:

State of Hawaii
Department of Land and Natural Resources
Division of Forestry and Wildlife

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FOREST MANAGEMENT PLAN SIGNATURE PAGE

Hawaii District certification: This plan was prepared by a team of Division of Forestry and Wildlife (DOFAW) staff to provide a management framework for the listed Forest Reserve lands. The plan was developed after consultation with other governmental agencies, community, and environmental organizations during an Environmental Assessment review process.

_____ _____

Roger H. Imoto - Hawaii District Branch Manager Date

DOFAW Administrator's approval: I have reviewed the enclosed Forest Management Plan and concur with the recommendations herein. I agree that resource management implementation will follow those specified in the Management Plan for the Forest Reserve listed.

_____ _____

Paul J. Conry - Administrator Date

Department of Land and Natural Resources Board approval: This plan meets the criteria established for State Forest Reserve Management Plans as mandated by Chapter 183, Section 16.5, Hawaii Revised Statutes.

_____ _____

Peter T. Young - Board Chairperson Date

I. INTRODUCTION

The Department of Land and Natural Resources, Division of Forestry and Wildlife proposes to stimulate the reforestation of native koa (*Acacia koa*) in approximately 600 acres of heavily degraded forest areas in the Hilo Forest Reserve. The project area is located within the Resource Subzone of the State Land Use Conservation District on State land. As such, the project requires an Environmental Assessment prepared in accordance with Hawaii Revised Statutes Chapter 343, a process that was completed as of September 2006. After Board of Land and Natural Resources approval of this Management Plan, the following actions will be taken:

1. Stimulation of natural koa regeneration via soil scarification of the project areas that will not have any koa timber salvage activity.
2. A Request for Proposals (RFP) will be issued for koa timber salvage in one unit comprised of approximately 205 acres. The best proposal(s) will be selected by an Evaluation Committee using a comparative criteria evaluation based in part on value-added processing of local timber, number and types of direct and indirect jobs to be created, and qualification of the applicant(s).
3. Commercial Harvest Permits and/or Timber Land Licenses will be issued to the selected applicant(s) after negotiating the terms and conditions of the license.
4. Following koa salvage operations, the Division will also conduct soil scarification work in this unit where koa regeneration is not evident.

Forest ecosystems of the Hawaiian Islands are among the world's most spectacular examples of the ecological and evolutionary processes of speciation and adaptation. Millions of years of isolation from continental landmasses have resulted in outstanding adaptive radiations of native forest birds, plants, and insects from relatively few colonizing events. These biological resources are integral elements of the natural and cultural heritage of the Hawaiian Islands and their people.

Hawaii's forests also play a critical role as watersheds, providing recharge to critical underground aquifers and/or supplying surface water to agricultural, residential and commercial users each year. Unfortunately, many of the natural forest ecosystems of Hawai'i have been destroyed through clearing for pasture use or degraded by feral animal activity and the spread of invasive plant species.

The proposed action is to restore a portion of the Hilo Forest Reserve that was degraded by long-term feral cattle grazing and the invasive species banana poka (*Passiflora mollissima*). The project area is located in the upper elevation areas of the Laupāhoehoe and Humu'ula Sections of the Hilo Forest Reserve. These areas are adjacent to State and private lands traditionally used for long-term cattle grazing operations. Though the forest reserve boundaries were fenced, these fences were not always well-maintained by the ranching lessees and range cattle commonly crossed into forested lands. As a result of the almost continuous presence of feral cattle populations, native flora has been heavily impacted. Most of the existing older koa in the project area is either dead or dying, and the groundcover layer of the proposed project area is dominated by kikuyu grass (*Pennisetum clandestinum*) and 'ākala berry (*Rubus hawaiiensis*) which are suspected of interfering with koa seedling establishment and possibly seed germination.

Koa is an early successional species that requires and responds vigorously to site disturbance. The proposed actions of soil scarification and salvage of limited koa logs will stimulate natural koa regeneration and koa forest growth. Over the long-term, restoration of native koa forest will partially remedy the decline and disappearance of native ecosystems, increase available habitat for native birds and invertebrates, and improve watershed capacity.

This project will employ surface soil scarification to reduce competition from grasses and weeds, such as Hamakua pamakani (*Ageratina riparia*), in areas most heavily impacted by feral cattle and to stimulate natural koa regeneration and native koa forest growth. Over the long-term, the project is anticipated to have positive benefits as degraded forest transitions to a healthier koa forest, improving the watershed capacity and habitat for native species, and is intended to serve as a model for restoration of other degraded koa forest lands.

II. DIVISION OF FORESTRY AND WILDLIFE

The activities listed under this management plan will be carried out by Hawaii's Division of Forestry and Wildlife. On the Island of Hawaii, DOFAW has direct management responsibility for over 700,000 acres of which over 400,000 acres are within the Forest Reserve system. Principal responsibilities for DOFAW statewide include forest product development to include nursery seedling production, watershed and endangered species protection, natural area reserve development and enhancement, wildlife fire suppression, public trail and access, and game management programs. Cooperative natural resources programs are also planned and implemented on private owned forest lands through natural area partnerships, forest stewardship programs, urban forestry projects, service forestry, and other agreements.

III. PURPOSE OF THE FOREST MANAGEMENT PLAN

This management plan for specified portions of the Hilo Forest Reserve is designed to meet the requirements listed in the Final Environmental Assessment for the scarification and koa salvage activities as well as the requirements of Hawai'i Revised Statutes Chapter 183-16.5:

> *183-16.5 Harvesting from state-owned lands. All Harvesting of trees on public lands shall be done in accordance with a management plan approved by the board, and in accordance with the provisions regarding conservation of aquatic life, wildlife, and land plants and the provisions regarding environmental impact statements. For any harvesting of native trees from public lands, the department shall use existing fire prevention and management programs and ensure that appropriate silvicultural practices are used to encourage native biodiversity and ecosystem processes. No native forests on public lands shall be converted to introduced forest plantations.*

IV. HILO FOREST RESERVE

A. Location: The proposed koa reforestation project area, consisting of approximately 600 acres within the State-owned Hilo Forest Reserve, TMK parcels 3-37-001-002, 3-37-001-008 and 3-37-001-009 (Table 1, Figure 1). The Hilo Forest Reserve protects forested watershed on the northeastern middle slopes of Mauna Kea, from the 1881 lava flow at Pi'ihonua to Humu'ula. Koa reforestation is planned for four non-contiguous areas in the *mauka* portion of the Humu'ula and Laupāhoehoe sections of the Hilo Forest Reserve, in the northern end of the Humu'ula and Laupāhoehoe ahupua'a. The ahupua'a of Waipunalei is located between the two project area units.

Table 1. Management Units within the Hilo Forest Reserve Reforestation Project.

Unit	Acres	Land Cover Description
Humu'ula Unit: Forest	205	Degraded forest
Humu'ula Unit: Pasture	4	Degraded pasture
Laupāhoehoe Unit: Forest	355	Degraded forest
Laupāhoehoe Unit: Pasture	35	Degraded pasture
Total	599	

Mauka of the project area are lands owned by the Department of Hawaiian Home Lands, historically used for grazing and more recently subject to koa reforestation and salvage efforts similar to the methods proposed in this document. Further *mauka* is the Mauna Kea Forest Reserve. *Makai* of the project area is the Hilo Forest Reserve and the Laupāhoehoe Natural Area Reserve. Hakalau National Wildlife Refuge is located to the south of the project area.

B. Access: The project area can be accessed by four-wheel drive vehicle from Saddle Road via the Mauna Kea Access Road, and then via the Mana-Keanakolu Road.

C. Physical site data: The project area is situated between 4,900 and 5,900 feet in elevation. Rainfall in the project area ranges from 60 to 100 inches per year, as a result of trade winds bringing moisture laden clouds which pile up against the slope of Mauna Kea in a belt extending from 2,000 feet to 6,000 feet.

Soils in the project area are from the Hanaipoe-Maile-Puu Oo association. These are deep, gently sloping to steep, well-drained soils found on uplands that have a medium-textured to moderately fine textured subsoil. Soils in the project area are well-drained silt-loams that formed in volcanic ash and consist of Hanipoe very stony loam, 12 to 20 percent slopes (HCD), Hanipoe silt loam, 12 to 20 percent slopes (HDD), and Puu silt loam, 6 to 12 percent slopes (PUC). In general, these soils have a dark surface layer that is high in content of organic matter. The total area of this association is about 6 percent of the island, and these soil types are used for pasture and woodland. The NRCS Soil Survey notes that this soil association produces some of the finest pasture on the island of Hawaii, has some excellent stands of tree plantings, and is favorable for many kinds of kinds of vegetables, though most areas are too steep for intensive cultivation and erosion control. Runoff is slow and the erosion hazard is slight.

Figure 1

The project area is located in Volcanic Hazard Zone 8, reflecting the limited probability of future coverage by lava flows. Most of Hazard Zone 8 has not been affected by lava flows within the past 10,000 years. Mauna Kea last erupted about 4,500 years ago, and is considered dormant.

There are no perennial streams within the project area. However, the sources of Kaawalii Stream and of Ha'akoa Stream are located approximately one-half to one mile *makai* of the project area boundary.

D. History of Hilo Forest Reserve: During pre-contact, it is likely that the project area, located in the upper Hilo Forest Reserve, provided important forest resources. While the lower elevation koa forests above Hilo and Kona were the primary traditional sources for canoes, being closer to the ocean, the upper forests of Laupāhoehoe and Humu'ula may have provided a number of edible and medicinal plants and been a location for the collection of bird feathers.

Mauna Kea may be literally interpreted as "white mountain" because during the winters, the summit is covered in snow. Mauna Kea may also be translated as "Wakea's Mountain." Wakea, also written and pronounced as Akea and Kea, was the god-father of the island of Hawai'i. The island child was born by Papa or Haumea, the goddess who gave birth to the islands. Humu'ula is defined in the Hawaiian dictionary as red jasper stone, as used for adze. There is an adze quarry located near the summit of Mauna Kea and the project area may have been traversed as a route to the quarry.

Boundary Commission testimonies describe trails through the forest lands, rising from the lowlands of Waiākea, 'Ōla'a, Keauhou, and Humu'ula. A cross-island trail generally forms the boundaries between the Humu'ula ahupua'a and *makai*-side ahupua'a. In the 19th century, it was called the Laumai'a Road, but it likely originated in earlier times. The present Mana-Keanakolu Road roughly follows the Laumai'a alignment. Based on the native traditions and kama'āina testimonies given before the Boundary Commission, it is likely that additional "practitioner" trails existed throughout the forest region. Features such as "*kauhale manu*" (bird-catcher's shelters), "*kahua kālaiwa'a*" (canoe-makers clearings), "*o'io'ina*" (trailside resting places and shelters), the "*ala hele*" (trails), and other features associated with traditional and customary accesses, would leave little evidence in the present-day, as the traditional features and uses generally had minimal impact on the natural landscape. Those things left behind, not cared for or maintained, were simply reabsorbed into the landscape.

For much of the post-contact period to the mid-1800s, the land use of the general project area would not have changed significantly, but indirect impacts to the forest would have begun as cattle and goats introduced by George Vancouver in the late 1700s spread across the island of Hawai'i.

During the 1800s, wild cattle were in great numbers and fairly wide ranging across the slopes of Mauna Kea. The Keanakolu area served as a major focal point. In the early 1800s, base camps and huts were built in the area by foreigners and Native Hawaiians who were exploiting the wild cattle herds on these upland slopes. To deliver hides and barrels of salted beef to ports at Hilo and Kawaihae, bullock hunters focused their efforts along relatively easy transportation routes.

One method of capturing cattle in the region was bullock pits. It is likely that bullock pits, as described below, were located along the Mana-Keanakolu Road.

Beginning in the 1820s and continuing into the 20th century, the mesic forested lands were logged and burned to clear the land for cattle ranching. When the extensive ahupua'a of Humu'ula was first leased by the government in 1862, the lessee established one of its two major sheep stations at Keanakolu. Subsequent lessees continued to use and expand the Keanakolu facilities as a base of operations for this side of the mountain.

By the end of the century, there were two major ranches in the area, Kukaiau Ranch and Puu Oo Ranch. Later, Parker Ranch occupied most of the Humu'ula ahupua'a. While the Humu'ula forest may have been too far to supply firewood for sugar plantations along the Hamakua coast, sheep and cattle ranching, and their wild counterparts probably accounted for most of the depletion of the timber resources. Trees were also used as fence posts for the ranching industry.

By the early 1900s, major portions of the Humu'ula and Laupāhoehoe ahupua'a were designated forest reserve lands as part of the Hilo Forest Reserve. Parker Ranch began to use its leased and private land holdings near Keanakolu solely for cattle ranching. Facilities on Forest Reserve lands became a headquarters for forestry fencing, survey, and nursery projects in the area, while those on Parker Ranch's leased land in Humu'ula were being developed to support its increasingly modernized cattle ranching operations.

The Civilian Conservation Corps (CCC), established by the Federal government in the 1930's, constructed fences to control an estimated 40,000 feral sheep that were impacting native forests, primarily mamane. The CCC had numerous camps along the fence-lines and Mana-Keanakolu Road was greatly improved by the CCC. The CCC also participated in tree planting, trail construction, and maintenance.

E. Existing Vegetation: The project area is predominantly characterized as degraded koa/'ōhi'a (*Metrosideros polymorpha*) montane mesic forest with patches of forest interrupted by larger openings dominated by introduced grasses mixed with endemic species of young koa and 'ākala. Above 5,800 feet in both the Humu'ula and Laupāhoehoe units are open areas dominated by 'ākala berry and kikuyu grass with some young koa present. Banana poka (*Passiflora tarminiana*) remains present, but in greatly reduced numbers since the introduction of the Septoria fungus. Also present are pasture-type openings dominated by sweet vernal grass (*Anthoxanthum odoratum*), velvet grass (*Holcus lanatus*), and kikuyu grass.

Near the *mauka* boundary of the forest reserve, outside the immediate project area, are planted stands of sugi (*Cryptomeria japonica*), redwood (*Macrocarpa cupressus*), *Eucalyptus* spp., ironwood (*Casuarina equisetifolia*) and other introduced conifers. On the steeper slopes where cattle were less likely to graze, the native forest has a closed to open canopy up to 35 meters in height, consisting of emergent koa over 'ōhi'a, kōlea (*Myrsine lessertiana*), and pilo (*Coprosma rhynchoocarpa*), with a subcanopy of 'āweoweo (*Chenopodium oahuense*). Scattered in the subcanopy are 'ōlapa (*Cheirodendron trigynum*) and manono (*Hedyotis terminalis*) and in the understory are occasional ferns such as hō'i'o (*Diplazium sandwichianum*) and laukahi (*Dryopteris wallichiana*). Other native constituents found in this forest type are the vines *Sicyos*

macrophyllus and maile (*Alyxia oliviformis*), and the sedge *Carex alligata.* This forest type is present in a mosaic with more open areas down to about 4,900 feet elevation in both the Laupāhoehoe and Humu'ula sections of the Forest Reserve.

Below the 4,900 feet elevation, the forest becomes more dominated by 'ōhi'a and as it is wetter, slightly different understory species are present, including kanawao (*Brousaissia arguta*) and hāpu'u (*Cibotium* spp.). In this region, the forest becomes more densely vegetated and is wetter than above – because of this, this lower Forest Reserve area is not included in the current reforestation project.

No endangered plant species were observed within the project area during a botanical survey conducted by DOFAW staff in 2004 (Appendix A). The *mauka* portion of the Laupāhoehoe project area is within the federally designated critical habitat for the endangered plant *Clermontia pyrularia*, though no known individuals of this species have been identified within the project area.

The DOFAW Draft Management Guidelines classify the Humu'ula project area as primarily V4 (badly degraded areas), with the *makai* edge of the project area classified as V2 (predominantly native areas). The Laupāhoehoe project area section is classified as V3 (considerably disturbed areas).

F. Existing wildlife: Several native birds endemic to the Hawaiian Islands have been observed in the project area including the 'apapane (*Himatione sanguinea*), 'amakihi (*Hemignathus virens*), 'i'iwi (*Vestiaria coccinea*), 'ōma'o (*Myadestes obscurus*), pueo (*Asio flammeus sandwicensis*)and the endangered 'io (*Buteo solitarius*) or Hawaiian hawk (see Appendix B for the faunal survey conducted by DOFAW staff).

'Ōpe'ape'a, or the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), are found in the project area. Surveys for the bat were conducted by the Hawaiian Bat Research Cooperative team on two nights in the fall of 2005 and one night in the spring of 2006 in the area of the proposed koa salvage. On each of the three nights, the survey team detected bats in the area of the orchard, old cabin, or roads in the vicinity. The detections consisted of single passes, which could indicate that bats were commuting or passing through the area. Activity was associated with edge or open habitat, and the survey team detected no signs of feeding (feeding buzzes or consistent activity), though it is suspected that bats forage in the general area.

The Division is unaware of specific studies of the invertebrate community for the project area. Given the degraded condition of the project area, few native invertebrates may be supported. However, observations on Kaho'olawe and other managed areas demonstrate that native invertebrates respond quickly to restoration of habitat and will recolonize areas on their own after native plantings. In addition, as koa is of particular importance as habitat for a wide range of native invertebrates, including the koa bug (*Coleotichus blackburni*) and koa butterfly (*Udara blackburni*), the restoration of a koa forest would provide additional habitat for diverse invertebrate species.

Non-native birds observed in the project area include the Japanese white-eye (*Zosterops japonica*), the house finch (*Carpodacus mexicanus*), the Northern cardinal (*Cardinalis cardinalis*), and common myna (*Acidotheris tristis*). The hunting of game birds is permitted in the Hilo Forest Reserve, implying the presence of game birds such as francolin and quail in the project area.

Non-native mammals observed or thought to occur in the project area include feral pigs (*Sus scrofa*), mongoose (*Herpestes auropunctatus*), cattle (*Bos taurus*), feral dogs (*Canus familiaris*), rats (*Rattus spp.*), and cats (*Felis catus*).

G. Archeological and Historical Sites: Between May 2 and 6, 2005, staff archaeologists with Division of State Parks staff conducted an archaeological survey of the proposed project areas on behalf of DOFAW. Survey coverage was limited to a total of five transects because it was not feasible or warranted to survey either project area in its entirety due to thick vegetation, rough terrain, and generally low probability of historic properties being present in these areas. To gain a better understanding of what historic properties could be present in the general area, State Parks staff also spent a day with Dr. Peter Mills, an archaeologist at the University of Hawaii at Hilo, who has been conducting archaeological research in the Keanakolu area for several years. Dr. Mills and his students have identified and studied a number of historic-period stone features located inland of the current project areas. Most were ranching related features that appear to have been created and used primarily during the second half of the 1800s.

No historic properties were found on any of the five transects surveyed within the project areas to be directly impacted by the proposed scarification and salvage operations. This includes an absence of surface features or any evidence of subsurface deposits in areas where soil deposits were exposed by pig wallowing, by the uplifted root crowns of fallen trees, along access roads, or in animal tracks. This absence of sites is consistent with results of other archaeological surveys in comparable sections of the Hilo Forest Reserve and with the historic record of activities in Keanakolu, which suggest that the highest intensity of use between 1800 and the 1940s, particularly those activities that were most likely to leave durable remains, occurred outside the current project area.

Several historic-period structures were, however, identified within the larger "area of potential effect" of the Humu'ula section of the project area, which includes a buffer of 500 feet around the limits of the directly affected project area. State Park archaeologists believe that as a complex, these features are significant under multiple National Register criteria. The complex consists of a koa log cabin built sometime between 1876 and 1885 as part of the original sheep station at Keanakolu, auxiliary buildings constructed around the log cabin in 1927 to temporarily house forestry workers, experimental fruit orchards and arboretum that were fully established by 1921, and a series of fence lines that delineated the orchards, corrals, and experimental planting plots. The log cabin and layout of some of the fence lines reflect the period from 1876 and 1905 when Keanakolu was used primarily as a sheep station. The other structures and features are associated with the early establishment and management of the Hilo Forest Reserve from 1905 through the 1940s. Although all these structures and features have been modified or have changed over time, they all retain sufficient integrity to convey their original function, use of

materials, design, and layout. The koa log cabin is, in particular, a unique and unusual example of 1800s log cabin construction in Hawaii using logs from a native tree.

No cultural practices were identified by consulted parties during thr pre-consultation phase of the Environmental Assessment that may be impacted by the elements of the proposed koa reforestation and salvage project. Gathering of plant material, for lei making, medicinal use, or other Native Hawaiian traditional use, may occur in the Hilo Forest Reserve. Recreational public hunting currently occurs within the Hilo Forest Reserve.

H. Other Public Uses: The Humu'ula and Laupāhoehoe sections of the Hilo Forest Reserve are located within the Resource Subzone of the Conservation District. Both sections are zoned Forest Reserve by the County, and the County General Plan (2005) designation for the area is Conservation. The project area is not located in the County of Hawaii's Special Management Area.

The primary use of the project area is as Forest Reserve. Hunting is allowed pursuant to the hunting rules of the Department. The Humu'ula Units are within State Hunting Unit B, which allows the hunting of wild pigs, sheep, and goats by rifle, muzzleloader, shotgun, handgun, bow and arrow, spear, and knife, with dogs, daily, year-round, with a bag limit of two pigs, one goat, and one sheep per day. Special conditions prohibit access to Humu'ula from Keanakolu Road. The Laupāhoehoe Units are within State Hunting Unit C, which allows the hunting of wild pigs, and wild sheep by rifle, muzzleloader, handgun, shotgun, and bow and arrow, dogs not permitted, Saturday, Sunday and holidays year-round, with a bag limit of two pigs and one sheep per day. Special conditions require a phone-in reservation from the DOFAW Hilo office. Game bird hunting is allowed in both sections Saturdays, Sundays, and holidays from the first Saturday of November through the third Sunday in January.

The DOFAW Draft Management Guidelines classify the Humu'ula project area as A2 (majority of project area) and A4 (the uppermost portion of Humu'ula Forest Reserve, including the orchard) for game control management. The Laupāhoehoe project area is A2 for game control management. An A2 (mixed game control) ranking reflects that game management is an objective integrated with other uses, that habitat may be manipulated for game enhancement, and that game populations are managed to acceptable levels using public hunting, while an A4 (staff control of game) ranking reflects that it is an area designated for animal removal by staff or agency designees because of environmental sensitivity, remoteness, or public safety. Both sections are classified as R2 (medium use) for recreational activities, reflecting that these are areas where outdoor recreation is limited or controlled, or where it may be integrated with other uses.

In cooperation with the Department of Land and Natural Resources, the U.S. Forest Service has initiated proceedings to establish a Hawai'i Tropical Experiment Forest, composed of two sections. The project area is within the boundary of the section proposed for inclusion at Laupāhoehoe. Forest Service staff have expressed interest in conducting long-term monitoring and research relating to the proposed koa reforestation efforts.

Funding for this project includes $27,850 from the Forest Service and $27,850 State match composed of in-kind contributions and salaries. Additional funding may be accumulated from the salvage of koa as described earlier.

V. FOREST MANAGEMENT ACTIVITIES

Background: The Division of Forestry and Wildlife proposes to restore degraded koa forest in approximately 600 acres of the *mauka* portion of the Humu'ula and Laupāhoehoe sections of the Hilo Forest Reserve. The objective of forest restoration will be pursued in the designated project area through a combination of methods, including feral cattle control, scarification by bulldozer, salvage operations, koa outplantings, and related activities. Additional activities include fence repair, fence maintenance, and control of invasive weeds. Over the long-term, koa restoration will enhance native forest and watershed values.

The project area consists primarily of small pockets of ohia forest, surrounded by scattered dead or dying koa trees in open areas where the ground is covered by a thick mat of kikuyu grass and 'ākala berry. Because koa seeds have great longevity and typically build up in surface soils under and adjacent to existing trees, the project area is believed to contain a substantial seed bank making it a good candidate for koa forest restoration. However, the existing kikuyu grass prevents koa seed germination and feral cattle browse on seedlings that do sprout.

Natural koa regeneration: Soil scarification will be conducted by DOFAW staff using a D-8N bulldozer, clearing weeds (primarily kikuyu grass) and disturbing the soil to stimulate germination of the koa seed bank. Bulldozer scarification will occur only in areas open enough to allow passage by the bulldozer to avoid damage to existing healthy native trees, thereby reducing grass and weed competition in areas most heavily impacted by feral cattle. Feral cattle removal from the project area is intended to prevent damage to the resulting young koa seedlings and promote growth of a new forest. These actions may be supplemented with koa and other native tree seedling plantings as necessary.

Feral cattle control is already underway, having begun in July of 2003. Hunts were conducted from November 2003 to April 2004 where the public was allowed to harvest animals shot by DOFAW staff. These public salvage hunts were discontinued due to reduced public interest. The reduced interest is attributed to the long travel time required to reach the forest reserve, the low quantity of animals being removed, and the possibility of committing time and effort with no guarantee of salvageable meat. The boundary fence along the mauka, East and makai sides of the harvest unit in Humuula is being replaced to keep cattle out. After the fences are complete harvesting and scarification will begin. The Laupahoehoe unit is currently cattle free and we will continue to monitor and maintain the existing fence to keep cattle out. DOFAW also opened a special hunt season from November, 2005, through November 2006 in the Hilo Watershed north of Saddle Road to allow the public to hunt cattle themselves. This public hunt has been extended to November 2008. In addition to public hunts, DOFAW continues to monitor and control residual feral cattle and potential cattle reentries.

DOFAW will conduct supplemental planting of koa in portions of the project area where bulldozer accessibility is limited due to thick understory, proximity to healthy trees, or steep terrain. DOFAW will also plant koa and other native tree seedlings in selected areas where scarification or salvage efforts resulted in limited forest regeneration.

After the initial phase of scarification and koa outplanting, DOFAW will continue to monitor the site and conduct related management activities, such as fence repairs, kikuyu grass control, feral cattle control, and long-term monitoring and maintenance of koa regeneration. DOFAW may also seek assistance in monitoring from the U.S. Forest Service.

The restrictions planned on bulldozer operation and on koa salvage are expected to minimize the impact on the surrounding environment, as most of the existing trees would remain in place. This would retain most of what overstory exists, maintain wildlife habitat, and promote a more complex forest structure as the new koa grows and matures.

Timber inventory: From February 28 through March 4, 2005, DOFAW foresters conducted an inventory of potential koa timber resources for salvage in the Humu'ula Forest unit. The inventory work focused primarily on dead koa representing both standing trunks and those on the ground. Live koa trees were tallied for a small number of trees that had less than 10 percent live crown remaining and appeared to be in the final stages of decline. Staff foresters do not believe that any of the tallied live trees will live five years beyond the survey date. Removal of these dying standing trees will help to prevent inevitable future damage to young koa when they fall in the near future.

Every living koa tree with a diameter of 10 inches or larger and every standing dead koa tree in the unit were counted. All standing trees that were tallied for proposed salvage were measured to provide timber volume estimates. A subsample of koa trees that were both dead and down on the ground was taken, with tree count and timber volume results for the sample area extrapolated to the full unit acreage. The following data in Table 2 summarize the results of the timber salvage survey:

Table 2. Timber Salvage Survey Results.

	Harvest trees	Leave trees	Total trees	Percent harvest	Harvest density (trees/acre)	Volume estimate (net ft^3)
Standing live	23	2,029	2,052	1	0.1	1,835
Standing dead	157	245	402	39	0.8	7,790
Dead and down	598	1,200	1,798	33	2.9	25,292
Total	778	3,474	4,252	18	3.8	34,918

No young, healthy koa in the project area are eligible for salvage (Figure 2). The proposed harvest of 23 dying koa trees is limited to one percent of the live trees within the reforestation unit, or only one tree per 10 acres. These trees are all in very poor health (Figure 3). It is notable that during a November 2005 site visit, staff returned to a small portion of the unit and

Figure 2. Young healthy koa tree not eligible for harvest or salvage.

Figure 3. Live koa tree, identified as eligible for salvage

Figure 4. Tree at center of the photo was classified as a harvestable "standing live" tree during the survey, but died eight months later.

observed that limbs of one of these "standing live" trees had broken off and the portion standing was dead (Figure 4).

The remaining eligible trees are either standing dead trees or downed dead trees. Thirty-nine percent of the standing dead koa trees were marked for salvage harvest. An estimated 33 percent of the dead and down trees in the unit are proposed for salvage. While it was difficult to count and grade all dead and down koa logs due to dense grass cover, DOFAW intends that all dead and down logs containing merchantable volume be made available for salvage harvest.

An estimated 65 percent of the dead standing and dead down koa trees in the harvest unit are believed to contain no merchantable wood volume due to excessive rot or defect. Unmerchantable koa will remain on-site to provide ecosystem and habitat benefits. In viewing the unit totals, 82 percent of all koa in the unit are anticipated to remain after salvage operations are completed. Only an average of 3.8 trees per acre (a vast majority of which are dead) are proposed for salvage. These harvest levels and criteria are considered very conservative in the forestry profession. Based on the number of trees in the area, it is believed that there is a sufficient number of trees in the Humu'ula Forest unit to support salvage while leaving the majority of trees in place as habitat.

Timber salvage operations: Salvage of merchantable down, dead, or dying koa timber is planned only for the Humu'ula Forest unit of the project area (approximately 205 acres). Salvage activities are not anticipated for the Humu'ula Pasture unit, the Laupāhoehoe Pasture unit, or for the Laupāhoehoe Forest unit. However, DOFAW may allow salvage of individual canoe quality koa logs within these areas pursuant to existing DOFAW rules and procedures. It is anticipated that the activity involved in removing salvageable koa will scarify the ground sufficiently to encourage koa re-growth to some degree. DOFAW will follow up with supplemental work to ensure adequate scarification. This combination of management approaches is intended to enhance overall koa forest restoration efforts while providing a legitimate source for koa to the market. Potential benefits of this action will include salvaging a valuable resource that would otherwise be lost through decomposition, partially satisfying demand for this resource and potentially deterring the future theft of healthy live trees on other lands.

Request for proposals: The koa salvage bid process will clearly identify trees and log sections eligible for salvage and allow prospective salvage operators to submit bids for the right to salvage part or all of the eligible trees. Eligible dying koa trees would be identified in advance through GPS coordinates as well as markings on eligible standing trees, and DOFAW staff will monitor the salvage operations to ensure the salvage operator does not remove or unnecessarily damage any ineligible trees. DOFAW staff will also walk the harvest unit perimeter with the selected logger to prevent confusion. To further encourage compliance, the contract for koa salvage will outline penalties for salvage of ineligible trees.

The project will commence once all necessary approvals and the perimeter fence have been secured. The bid process for the salvage operations is anticipated to take three to twelve months. Meanwhile, DOFAW will initiate scarification by bulldozer in areas of the project area not proposed for koa salvage activities.

In evaluating proposals from commercial timber operators, DOFAW will consider multiple factors in quantifying the proposers potential for supporting reforestation and koa salvage goals in the subject management units. These may include, but not be limited to:

a. Proposers capacity for performing as stated (experience, equipment, etc.).
b. The use of sound methodology and modern equipment.
c. Compliance with Hawaii's Best Management Practices.
d. The degree to which local value-added wood processing and marketing is emphasized.
e. The quantity and type of employment generated.
f. Degree to which maximum koa wood utilization is detailed (both lumber and craft wood).
g. Timeliness of proposed scheudule.
h. The volumetric price each proposer will pay the State for timber resources.

VI. FOREST MANAGEMENT PRESCRIPTIONS

All field management activities will be guided by the Division's Best Management Practices for maintaining water quality in Hawaii (BMP), which can be found at: http://www.state.hi.us/dlnr/dofaw/pubs/BMPs_bestmanagement.pdf. The following native forest management considerations will serve as guidelines for the proposed project activities.

A. Threatened and Endangered species: Immediately prior to scarification activities, DOFAW staff will conduct a botanical and fauna survey of the area for both the present of native species and T&E species. If the presence of a T&E flora species is detected, a minimum buffer zone of 50 feet will be established around the site of the individual plant or population. If the presence of a fauna T&E species is detected either by sighting or location of a nest site, a 100 foot buffer zone will be placed around the location. The known T&E species site will be monitored by DOFAW and included in the State T&E database.

B. Native Species Management: In order to minimize overall damage to the remnant native vegetation in the project area, the following guidelines will be followed. There are no known areas of sensitive vegetation within the reforestation and salvage units. However if one is found it will be flagged off and care will be taken to avoid damaging the area. In addition, existing downed logs and woody debris left after tree harvest will not be windrowed (piled up). It is anticipated that the natural recovery of koa after scarification and/or koa salvage will compensate for any damage to native plant species incurred during restoration activities. Planted seedlings may require initial fertilization to encourage establishment; however, no fertilizer will be used on seedlings generated by scarification.

To avoid harming or harassing native birds, particularly the 'io, DOFAW staff will conduct additional surveys prior to salvage operations. No nests are anticipated to be found within the core project area, but if a nest is found in a salvageable tree, the nest tree would be left in place to allow the 'io to use the same nest in future years and would no longer be eligible for salvage. In addition, no activities will occur within 100 feet from the nest tree during breeding season to minimize disturbance to nesting 'io.

C. Noxious Weed Management: The transport of equipment and disturbance to the ground surface and vegetation involved with scarification and/or koa salvage operations may create conditions suitable for the establishment of weedy plants. The following practices will be implemented to minimize the introduction of alien plants and insects and to reduce the possibility of establishment. Any bulldozer or other heavy equipment used during scarification or koa salvage operations will be inspected and cleaned, following appropriate alien species prevention protocol. All permitees or licensees will be instructed on specific procedures to prevent the spread or introduction of noxious alien plants in the project area. In addition, precautions will be taken to prevent spreading alien plants already found in the project area, and all food, refuse, tools, and gear will be removed upon completion of work.

Upon completion of scarification, planting, or salvage activities, the project site will be monitored for the introduction or spread of invasive or weedy species for a period of three to ten years. It is expected that the use of herbicides to control invasive and other non-native plant species in the area will be required periodical. Herbicide activities will be closely monitored and chemicals will be used only as described on labeling. Other manual or biological methods for invasive species control will follow the guidelines listed in the Best Management Practice policies.

D. Insect and Disease Monitoring: The trees within the Hilo Forest Reserve project area will be monitored by DOFAW staff for evidence of insect damage or disease. If problem arises, proper qualified personal shall be consulted to identify the problem and potential control of the damage.

E. Fire Prevention and Control: The rainfall is the Hilo Forest Reserve is approximately 60 to 100 inches per year and thus wild fire threats remain only moderate. However, during times of extreme drought the land area may be subject to wild fires. Normal fire prevention of the Hilo Forest Reserve will involve the maintenance of access roads to serve as fire response road and firebreaks. During times of moderate or extreme drought conditions, DOFAW will issue Public Service Announcements to increase public awareness of the high fire risk and may restrict public access to the area. The primary fire response agencies for the Hilo Forest Reserve are DOFAW Primary Response and HCFD Primary Response Area/DOFAW Co-op Response Area. The selected logger will be required to complete a fire contingency plan, and must be willing to fight a fire in the harvest area with his equipment should one occur during the project.

F. Watershed Management: Based on the nature of the terrain and the lack of perennial streams within the project area, no adverse changes in the normal runoff or percolation patterns is anticipated as a result of this project. The presence of trees and other ground cover contribute to groundwater recharge of the large underground aquifer, thus the project is ultimately anticipated to improve water percolation and improve the watershed function of the project area. If the presence of any water features should be found during project activities, a 50 foot buffer will be established to avoid any accelerated soil runoff or impaired water quality. Temporary skid trails used during koa salvage operations will be ripped to relieve compaction and encourage seedling regeneration.

G. Public Hunting: Public hunting activities will be subject to DOFAW regulating hunting rules as set out in Chapter 122, Rules Regulating Game Bird Hunting and Chapter 123, Rules

Regulating Game Mammal Hunting, HRS. The proposed project is not anticipated to significantly impact contemporary cultural practice such as hunting. The restoration project is not designed to block access by people and no area will be removed from public hunting. Public access may be restricted/limited during times of reforestation or koa salvage activities and shall be posted at common public entrances to Hilo Forest Reserve. In Laupahoehoe hunting will not be impacted as it is only open on weekends and holidays.

H. Non-timber Forest Products: The proposed project is not expected to have any significant impacts on Native Hawaiian gathering or cultural groups. This is largely due to the remoteness of the project area, the difficult access, the restoration purpose, and the temporary nature of any limitations on access required for public safety during implementation of the project. Public access may be limited during times of reforestation activities and shall be posted at common public entrances to Hilo Forest Reserve as well as advertised in local newspapers prior to the closure.

I. Archaeological or Culturally Significant Sites: While there are no archaeological or cultural sites anticipated to be affected by the proposed action, should evidence of any archaeological or culturally significant sites be encountered during scarification and/or koa salvage operations, all activities would immediately cease and the appropriate agencies, including the State Division of Historic Preservation, would be consulted immediately.

J. Education and Research: No educational or research activities are currently conducted in the project site. Management prescription will be document to be uses as a guide or template for future projects in additional Forest Reserves applying koa reforestation activities.

Appendix A. Botanical Survey of the Humuula and Laupahoehoe Sections of Hilo Forest Reserve.

Laupahoehoe and Humuula Sections:

The uppermost regions of these sections of the Hilo Forest Reserve consist of degraded Koa/Ohia Montane Mesic Forest with patches of forest interrupted by larger openings dominated by introduced grasses mixed with young koa and akala. The areas that are open but not too steep are suitable for scarification and subsequent planting of koa seedlings if it is warranted. Above 5800 feet in the Laupahoehoe and Humuula sections are open areas dominated by akala (*Rubus hawaiiensis*) and banana poka (*Passiflora mollissima*) with some young koa (*Acacia koa*) present . Also present are pasture-type openings dominated by sweet vernal grass (*Anthoxanthum odoratum*), velvet grass (*Holcus lanatus*), and kikuyu grass (*Pennisetum clandestinum.*), and near the mauka boundary of the forest reserve are planted stands of sugi (*Cryptomeria japonica*), redwood (*Macrocarpa cupressus*), Eucalyptus spp., ironwood (*Casuarina equisetifolia*) and other introduced conifers. On the steeper slopes where cattle are less likely to graze the forest has a closed to open canopy up to 35 meters in height, consisting of emergent koa (*Acacia koa*) over ohia (*Metrosideros polymorpha*), kolea (*Myrsine lessertiana*), and pilo (*Coprosma rhynchocarpa*), with a subcanopy of aweoweo (*Chenopodium oahuense*). Scattered in the subcanopy are olapa (*Cheirodendron trigynum*) and manono (*Hedyotis terminalis*) and in the understory are occasional ferns such as ho`io (*Diplazium sandwichianum*) and *Dryopteris wallichiana*. Other native constituents found in this forest type are the vines *Sicyos macrophyllus*, and maile (*Alyxia oliviformis*), and the sedge *Carex alligata*. This forest type is present in a mosaic with more open areas down to about 4900 feet elevation in both the Laupahoehoe and Humuula sections of the forest reserve.

Below about 4900 feet elevation the forest becomes more dominated by ohia and as it is wetter, slightly different understory species are present, including Kanawao (*Brousaissia arguta*) and hapu`u (*Cibotium* spp.). In this region the forest becomes more densely vegetated and is wetter than above; presumably this area is not suitable for larger-scale scarification and koa planting.

A map has been prepared detailing the areas that are most suitable for scarification and subsequent koa tree planting.

Species encountered on Survey

Native Species:
Trees:
Acacia koa - common
Cheirodendron trigynum - occasional
Chenopodium oahuense - common
Coprosma rhynchocarpa - common
Dodonaea viscosa - occasional (tree ecotype found here)
Hedyotis terminalis – occasional

Ilex anomala - occasional
Melicope spp. - uncommon (only in wetter areas of survey)
Metrosideros polymorpha - common
Myoporum sandwicense - occasional
Myrsine lessertiana - common
Sophora chrysophylla - common in the uppermost elevations

Shrubs:
Brousaissia arguta - occasional
Phytolacca sandwicensis - occasional
Pipturus albidus - uncommon (only in wetter areas of survey)
Rubus hawaiiensis - common
Styphelia tameiameiae - occasional
Vaccinium calycinum - occasional

Ferns, Sedges and Vines:
Asplenium trichomanes - occasional
Athyrium microphyllum - uncommon (only in wetter areas of survey)
Diplazium sandwichianum - uncommon
Dryopteris fusco-atra - uncommon
Dryopteris glabra - uncommon
Dryopteris wallichiana - occasional
Elaphoglossum crassifolium - occasional
Pneumatopteris sandwicensis - uncommon (only in wetter areas of survey)

Carex alligata - occasional

Alyxia oliviformis - occasional
Sicyos macrophyllus - uncommon

Non-native Species:
Trees:
Eucalyptus spp. - occasional
Cryptomeria japonica - common
Macrocarpa cupressus - occasional
Casuarina equisetifolia - occasional

Shrubs:
Rubus argutus - common
Rubus rosifolius - occasional

Vines:
Passiflora mollissima - common

Herbs, grasses and ferns:
Geranium homeanum - occasional
Ludwigia octovalvis - occasional
Melilotus alba - occasional
Physalis peruviana - occasional
Polygonum punctatum - occasional
Rumex crispus - occasional
Senecio madagascariensis - occasional
Senecio sylvaticus - common

Dactylis glomerata - occasional
Ehrharta stipoides - occasional
Holcus lanatus - common
Pennisetum clandestinum - common
Sporobolus africanus - occasional

Pteridium aquilinum – occasional

Appendix B. Surveys of fauna were conducted in the subject parcels on March 25 and May 23, 2006.

The Laupahoehoe Section was surveyed by Joey Mello and Steve Bergfeld on May 23, 2006. A transect was done starting at the Blair Road gate at 5,430 foot elevation in a southwesterly direction along the boundary of the Forest Reserve. A second transect was done approximately 300-400m to the southeast, paralleling the first in a northeasterly direction back to Blair Road. All fauna detected by sight, sound and sign are noted below.

Native birds:
Amakihi *(Hemignathus virens)*
Apapane *(Himatione sanguinea)*
Iiwi *(Vestiaria coccinea)*
Omao *(Myadestes obscurus)*
Io *(Buteo solitarius)*

Non-native birds:
Japanese White Eye *(Zosterops japonicus)*
House Finch *(Carpodacus mexicanus)*
Northern Cardinal *(Cardinalis cardinalis)*

Other mammals
Mongoose *(Herpestes auropunctatus)*
Feral pig *(Sus scrofa)*
Feral dog *(Canus familiaris)*
Cattle *(Bos taurus)*

The Humuula Section was surveyed by Joey Mello and Raymond Mizuba on March 25, 2006. A transect was done on the loop trail below the log at Keanakolu orchard #1, continuing down slope to approximately 5,040 foot elevation, then along 5,040 contour toward the northwest boundary of the parcel, then down to 5,000 foot elevation, then southeast approximately to the center of Humuula Forest Reserve, then southwest back to orchard #1. All species identified by sight, sound and sign are noted below.

Native birds:
Amakihi *(Hemignathus virens)*
Apapane *(Himatione sanguinea)*
Iiwi *(Vestiaria coccinea)*
Omao *(Myadestes obscurus)*
Io *(Buteo solitarius)*

Non-native birds:
Japanese White Eye *(Zosterops japonicus)*
House Finch *(Carpodacus mexicanus)*
Northern Cardinal *(Cardinalis cardinalis)*
Common Myna *(Acidotheris tristis)*

Other mammals
Mongoose *(Herpestes auropunctatus)*
Feral pig *(Sus scrofa)*